भारतीय मानक
Indian Standard

IS 17016 : 2018

धनायनित परिवर्तित बिटुमिन इमल्शन — विशिष्टि

Cationic Modified Bitumen Emulsion — Specification

ICS 75.140; 93.080.20

© BIS 2018

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुरशाह ज़फर मार्ग, नई दिल्ली – 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI-110002
www.bis.gov.in www.standardsbis.in

September 2018 **Price Group 2**

Bitumen, Tar and Related Products Sectional Committee, PCD 06

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards after the draft finalized by the Bitumen, Tar and Related Products Sectional Committee, PCD 06 had been approved by the Petroleum, Coal and Related Product Division Council.

This Indian Standard prescribes requirements of modified bitumen emulsion for various roads construction and maintenance activities. This Indian Standard covers following main parameters:

a) Requirements of material (modifier and grade of bitumen); and
b) Modified bitumen emulsions of following three grades:
    1) Quick Setting Modified Emulsion (QSME),
    2) Rapid Setting Modified Emulsion (RSME), and
    3) Slow Setting Modified Emulsion (SSME).

Modified bitumen emulsions are mainly used for tack coat, fog seal, cold mix, micro surfacing and slurry seal application. These can also be used for other applications of construction and maintenance, where emulsions covered in existing code may not serve the intended purpose.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

CATIONIC MODIFIED BITUMEN EMULSION — SPECIFICATION

1 SCOPE

1.1 This standard specifies the requirements and methods of sampling and tests of cationic modified bitumen emulsions for road works.

1.2 Application

Cationic modified bitumen emulsion (CMBE) may be used as binder for tack coat, penetration macadam, surface dressing (chip seal), fog seal, cold recycling, preparation of cold pre-mix for construction and maintenance of roads as well as binder for micro-surfacing and slurry seal applications. Recommended use of cationic modified bitumen emulsion is given at Annex A.

2 REFERENCES

The standards given below contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreement based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below:

IS No./ Other Publication	*Title*
IS 73 : 2013	Paving bitumen — Specification (*fourth revision*)
IS 334 : 2002	Glossary of terms relating to bitumen and tar (*third revision*)
IS 1201 : 1978	Methods of testing tar and bituminous materials — Sampling (*first revision*)
IS 1203 : 1978	Methods of testing tar and bituminous materials — Determination of penetration (*first revision*)
IS 1205 : 1978	Methods for testing tar and bituminous material — Determination of softening point (*first revision*)
IS 1208 : 1978	Methods of testing tar and bituminous materials — Determination of ductility (*first revision*)
IS 4588 : 1986	Specification for rubber, raw, natural (*third revision*)
IS 8887 : 2017	Bitumen emulsion for roads (cationic type) — Specifications
IS 11356 : 1985	Styrene-butadiene rubber latex
IS 15462 : 2004	Specification of rubber and polymer modified bitumen

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 334 and the following shall apply.

3.1 Cationic Modified Bitumen Emulsion (CMBE)

A Cationic modified emulsion is the one in which the cation of the emulsifier is at the interface of the bitumen particle; an emulsion in which the particles are positively charged and the aqueous phase is acidic. Breaking of these emulsions occurs by neutralization of charge. Modifier is either added in aqueous phase during emulsification or bitumen pretreated with modifier is emulsified.

3.2 Modifier

Properties of bitumen emulsion can be improved by incorporation of certain additives or blend of additives. These additives are called modifiers and the cationic bitumen emulsion modified with these modifiers is known as cationic modified bitumen emulsion. Cationic modified bitumen emulsion is expected to give higher life of surfacing depending upon degree of modifications and type of additives and modification process used.

4 MATERIAL

4.1 Any suitable grade of bitumen as given in IS 73 or modified bitumen as given in IS 15462 with or without addition of suitable flux, shall be used. For modification in bituminous phase, modifier may be a polymer, rubber compatible with bitumen.

4.2 Any emulsifying agent or any other ingredient, which either quality-wise or quantity wise, is likely to affect or harden the residue bitumen beyond the limits specified of Table 1, Sl. No. (vii) shall not be used.

4.3 For modification in aqueous phase, modifier shall be Styrene Butadiene Rubber (SBR) as per IS 11356 or natural rubber as per IS 4588.

5 GRADES

Cationic modified bitumen emulsion shall be of following three grades:

a) Quick Setting Modified Emulsion (QSME);
b) Rapid Setting Modified Emulsion (RSME); and
c) Slow Setting Modified Emulsion (SSME).

6 REQUIREMENTS

6.1 Cationic modified bitumen emulsion shall be homogeneous without any separation of modifiers, un-dispersed bitumen within six months of manufacturing after thorough mixing.

6.2 The cationic modified bitumen emulsions shall also comply with the requirements specified in Table 1.

7 SAMPLING

7.1 For the purpose of testing, the size of the sample and the sampling procedure from drums, barrels or bulk supply shall be as described in IS 1201 subject to the following:

a) **From Drums or Barrels** — The content of drum or barrel from which the sample is to be taken shall be thoroughly mixed by rolling the container to and fro for a period of 2 to 3 min, for a distance of 50 m, successively in opposite direction, allowing at least five revolutions of the container in each direction and then up-ending the container through two revolutions first in one direction and then in the opposite direction.
b) **From Bulk** — Where practicable, bulk delivery of bitumen emulsion shall be agitated by forced circulation or air agitation, before sampling.
c) The sample of bitumen emulsion shall be drawn within 24 h after delivery and tested within 7 days from the date of drawing, unless otherwise specified.

7.2 Preparation of Samples

Before carrying out any of tests, the sample shall be mixed by gentle shaking to ensure uniformity.

Table 1 Requirement of Cationic Modified Bitumen Emulsion

(*Clause* 6.2)

Sl. No.	Characteristics	Requirements			Method of Test, Ref to
		QSME	RSME	SSME	
(1)	(2)	(3)	(4)	(5)	(6)
i)	Residue on 600 µm Sieve (Percent by mass), *Max*	0.1	0.1	0.1	IS 8887
ii)	Viscosity by saybolt furol viscometer, at 25°C, seconds	20-100	20-100	20-100	IS 8887
iii)	Coagulation of emulsion at low temperature	Nil	Nil	Nil	IS 8887
iv)	Storage stability after 24 h, percent, *Max*	3	3	3	IS 8887
v)	Particle charge, +ve/-ve	+ve	+ve	+ve	IS 8887
vi)	Miscibility with water	No coagulation	No coagulation	No coagulation	IS 8887
vii)	Test on residue :				
	a) Residue by evaporation, percent, *Min*	60	60	60	IS 8887
	b) Penetration at 25°C, 100g, 5 s	40-100	40-100	40-100	IS 1203
	c) Ductility at 27°C, cm, *Min*	70	70	70	IS 1208
	d) Softening point, °C, *Min*	57	57	57	IS 1205
	e) Elastic recovery[1)], percent, *Min*	50	50	50	IS 15462
	f) Polymer content, percent, *Min*	To be reported	To be reported	To be reported	
	g) Stability to mixing with cement (percent coagulation, *Max*)	—	—	2	IS 8887
	h) Mixing time[1)], s	120-300	—	—	Annexure B

[1)] Applicable for Slurry / Micro surfacing application.

7.3 If the single sample from a single run fails to fulfill the test requirements specified in **6,** sample shall be drawn on the basis of **7.1** for testing in the same manner. If these samples conform to requirement of **6** the lot shall be accepted otherwise the lot shall be rejected.

8 MARKING

8.1 Each container shall be legibly and indelibly marked with the following:

a) Indication of the source of manufacture;
b) Month and year of manufacture;
c) Type/Grade;
d) Batch number; and
e) Date of expiry.

8.2 BIS Certification Marking

Each container may also be marked with the Standard Mark.

8.2.1 The use of the Standard Mark is governed by the provisions of *Bureau of Indian Standards Act,* 2016 and the Rules and Regulations made there under. The details of the conditions under which the licence for use of the Standard Mark may be granted to manufacturers of producers may be obtained from the Bureau of Indian Standards.

ANNEX A

(*Clause* 1.2)

RECOMMENDED USE OF CATIONIC MODIFIED BITUMEN EMULSION

The recommended uses of three types of modified bitumen emulsion of the cationic type suggested in this specification are given below:

Type	*Recommended Use*
QSME	Quick Setting Modified Emulsion grade, QSME is specially recommended for micro surfacing applications.
RSME	Rapid Setting Modified Emulsion grade, RSME is specially recommended for tack coat applications.
SSME	Slow Setting Modified Emulsion grade, SSME is specially recommended for applications like fog seal, cold mix, slurry seal, chip seal etc.

ANNEX B

[*Table* 1, *Sl. No.* vii (h)]

METHOD FOR DETERMINATION OF MIXING TIME OF SLURRY/MICROSURFACING MIXTURE

B-1 GENERAL

This test is intended to determine breaking time of emulsion in a slurry seal / micro surfacing mixture.

B-2 APPARATUS

Stainless steel bowl, spatula, beakers, measuring cylinder, spoon, balance.

B-3 METHOD

Take 1 kg of the graded aggregate and needed cement in bowl. Add required quantity of mixing water containing required dose of additive (if needed), to the aggregate and cement mixture. Mix the contents in bowl vigorously with the help of spatula so that a homogenous paste is formed. Add required quantity of emulsion and mix the contents in bowl with the help of spatula till the emulsion commences breaking (colour turns brown to blackish brown) and mix begins ceasing its workability. The time required for breaking emulsion is known as mixing time.

B-4 REPORT

Minimum time required for initial breaking of emulsion is reported as “Maximum Mixing Time”.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act*, 2016 to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards: Monthly Additions'.

This Indian Standard has been developed from Doc No.: PCD 06 (02509).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002
Telephones: 2323 0131, 2323 3375, 2323 9402 *Website*: www.bis.gov.in

Regional Offices:		*Telephones*
Central	: Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	2323 7617 2323 3841
Eastern	: 1/14 C.I.T. Scheme VII M, V.I.P. Road, Kankurgachi KOLKATA 700054	2337 8499, 2337 8561 2337 8626, 2337 9120
Northern	: Plot No. 4-A, Sector 27-B, Madhya Marg CHANDIGARH 160019	265 0206 265 0290
Southern	: C.I.T. Campus, IV Cross Road, CHENNAI 600113	2254 1216, 2254 1442 2254 2519, 2254 2315
Western	: Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400093	2832 9295, 2832 7858 2832 7891, 2832 7892

Branches : AHMEDABAD. BENGALURU. BHOPAL. BHUBANESHWAR. COIMBATORE. DEHRADUN. DURGAPUR. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. JAMMU. JAMSHEDPUR. KOCHI. LUCKNOW. NAGPUR. PARWANOO. PATNA. PUNE. RAIPUR. RAJKOT. VISAKHAPATNAM.

Published by BIS, New Delhi